LISTING OF THE CLAIMS:

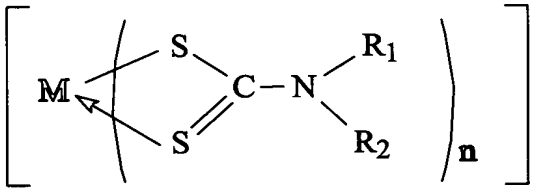
Claims 1-8 (Canceled)

Claim 9 (Currently Amended): ~~A~~ An aqueous lubricant comprising an aqueous liquid and at least one multi-ligand metal chelate compound ~~comprising~~ , said compound having the following structure:

at least one metal species selected from the group consisting of zinc, manganese, iron, molybdenum, tin and antimony, the metal species having multiple coordinating sites;

at least one polydentate chelate ligand having sulfur as a coordinating atom, the at least one ligand coordinating to at least one of the multiple coordination sites of the at least one metal species and having a formula selected from the group consisting of the following formulas (A) to (S):

(A)



wherein R_1 is the same as or different from R_2,

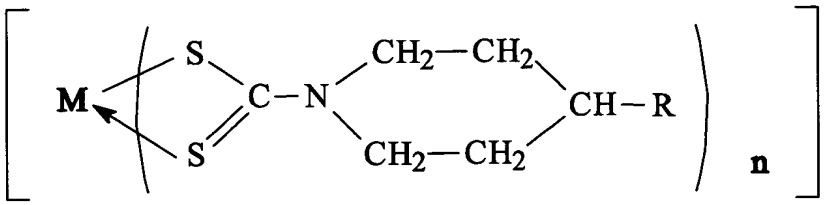
wherein when R_1 and R_2 are the same, each of R_1 and R_2 is H, $-CH_3$, $-C_2H_5$, $-C_3H_7$ (straight chain), iso-C_3H_7, $-C_4H_9$ (straight chain), iso-C_4H_9, tert-C_4H_9 or $-C_6H_5$, and

wherein when R_1 and R_2 are different, R_1 is H and R_2 is $-CH_3$, $-C_2H_5$, $-C_3H_7$ (straight chain), iso-C_3H_7, iso-C_4H_9, tert-C_4H_9 or $-C_4H_9$ (straight chain); or R_1 is $-CH_3$ or $-C_2H_5$ and R_2 is $-C_6H_5$,

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(B)

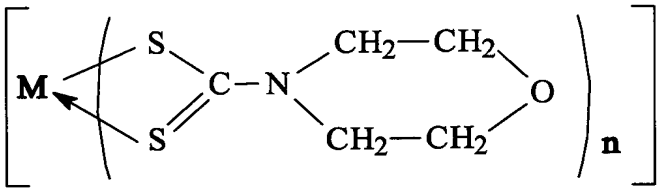


wherein R is H, $-CH_3$ or $-C_2H_5$, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

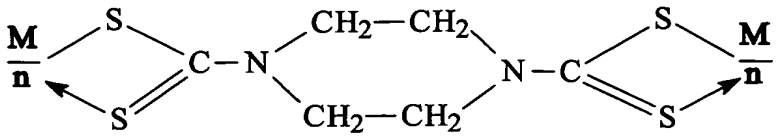
(C)



wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

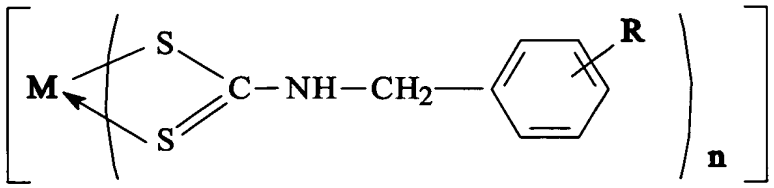
(D)



wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(E)

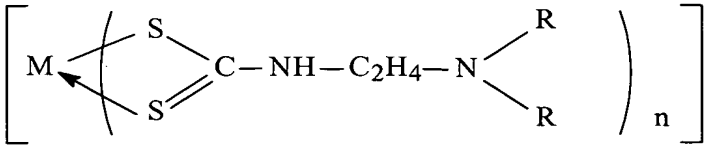


wherein R is ortho-NO_2, para-NO_2, meta-OCH_3, meta-CH_3 or meta-C_2H_5, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(F)

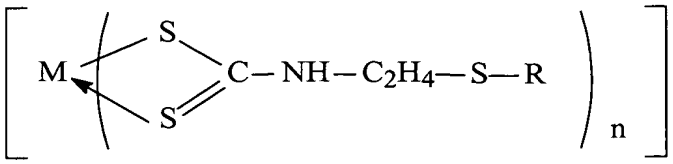


wherein R is -CH_3, -C_2H_5, -C_3H_7 (straight chain) or iso-C_3H_7, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(G)

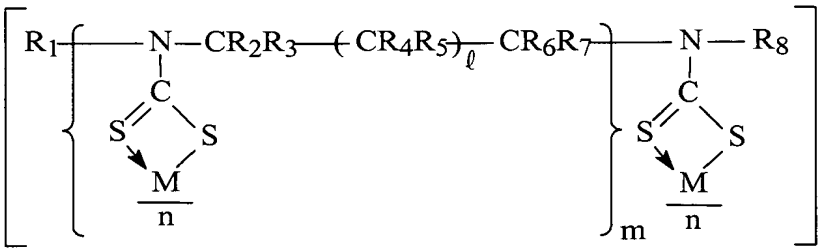


wherein R is H or an alkyl group of 1-12 carbon atoms, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(H)



wherein when m is 1 and ℓ is 0, R_1-R_3 and R_6-R_8 are H; or R_1 is -CH_3 and R_2-R_3, R_6-R_8 are H; or R_1 is -C_2H_5 and R_2-R_3, R_6-R_8 are H; or R_1 is -C_3H_5 (straight chain) or iso-C_3H_5 and R_2-R_3, R_6-R_8 are H; or R_1 is -C_4H_9 (straight chain), iso-C_4H_9 or tert-C_4H_9, and R_2-R_3, R_6-R_8 are H; or R_2 and R_3 are -CH_3 and R_1, R_6-R_8 are H; or R_2 and R_6 are -CH_3 and R_1, R_3, R_7-R_8 are H; or R_2, R_3, R_6 and R_7 are -CH_3 and R_1 and R_8 are H; or R_1 and R_8 are -CH_3 and R_2-R_3, R_6-R_7 are H; or R_1 and R_8 are -C_2H_5 and R_2-R_3, R_6-R_7 are H; or R_1 and R_8 are -C_3H_5 (straight chain) or iso-C_3H_5 and R_2-R_3, R_6, R_7 are H; or R_1 and R_8 are -C_4H_9 (straight chain), iso-C_4H_9 or tert-C_4H_9 and R_2-R_3, R_6-R_7 are H; or R_2 and R_6 are -C_6H_5 and R_1, R_3, R_7-R_8 are H, and

wherein when m is 1 and ℓ is 1, R_1-R_8 are H; or R_4 and R_5 are -CH_3 and R_1-R_3, R_6-R_8 are H, and

wherein when m is 1 and ℓ is selected from 2, 3, 4, 5, 6 and 7, R_1-R_8 are H, and

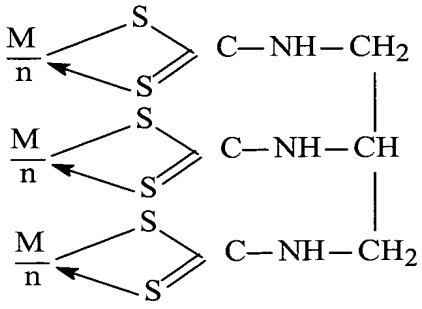
wherein when m is selected from 2, 3, 4, 5, 6, 7, 8 and 9 and ℓ is 0, R_1-R_8 are H; or R_2 is $-CH_3$ and R_1, R_3, R_6-R_8 are H, and

wherein when m is selected from 2, 3, 4, 5, 6, 7, 8 and 9 and ℓ is 1, R_1-R_8 are H, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

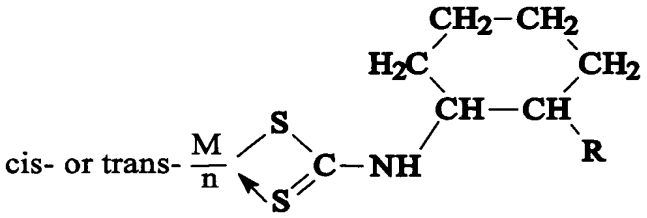
(I)



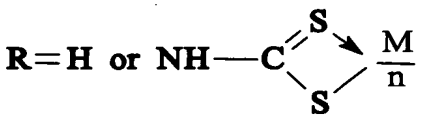
wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(J)



wherein

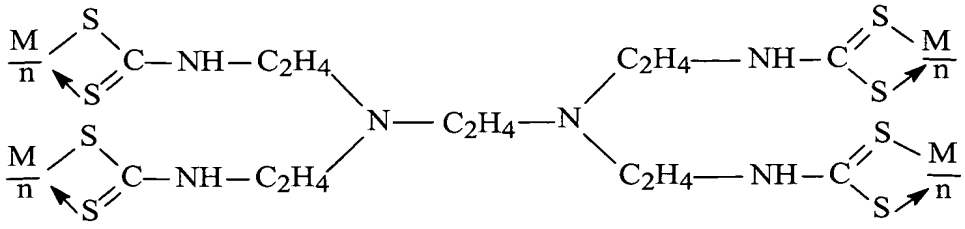


and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

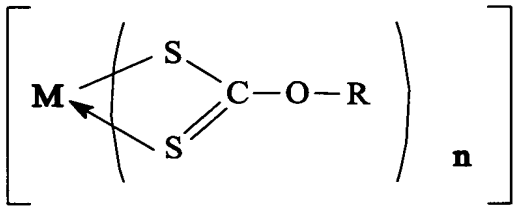
(K)



wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(L)

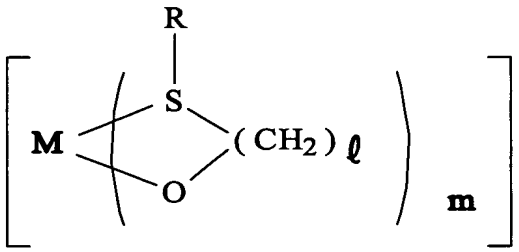


wherein R is a linear or branched alkyl group of 1-12 carbon atoms, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(M)

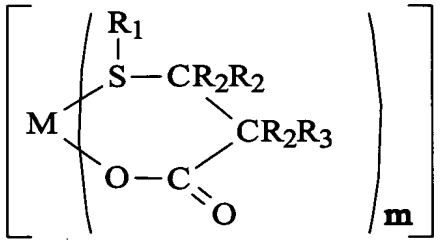


wherein R is H and ℓ is selected from 2 and 3; or R is an alkyl group of 1-12 carbon atoms and ℓ is selected from 2 and 3, and

wherein when M is zinc, molybdenum, tin or antimony, m is 1, and

wherein when M is manganese or iron, m is 1 or 2,

(N)

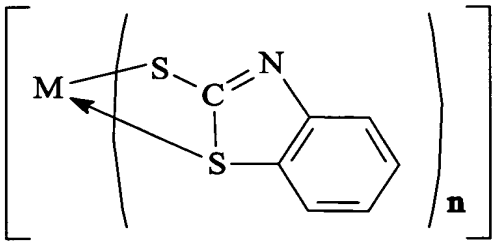


wherein R_1-R_3 are H; or R_1 is an alkyl group of 1-12 carbon atoms, R_2-R_3 are H; or R_1-R_2 are H, R_3 is -NH_2, and

wherein when M is zinc, molybdenum, tin or antimony, m is 1, and

wherein when M is manganese or iron, m is 1 or 2,

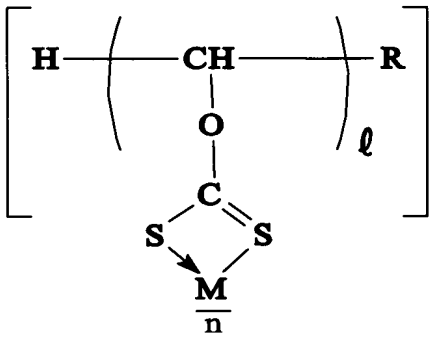
(O)



wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(P)

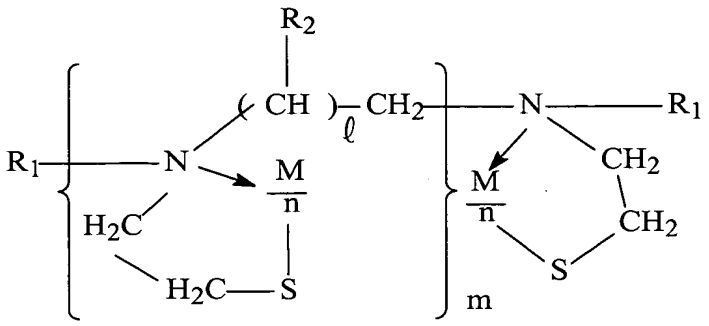


wherein ℓ is selected from 1, 2, 3, 4, 5 and 6, R is H or -COOH, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(Q)

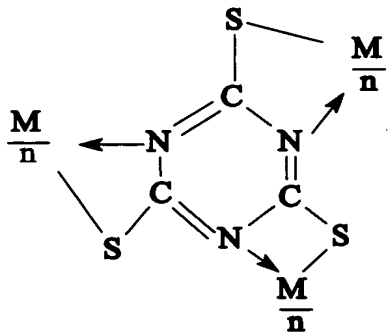


wherein R_1 and R_2 are H, ℓ is 1 or 2, m is selected from 1, 2, 3, 4, 5 and 6; or R_1 is -$C_2H_4S^-$, R_2 is H, ℓ is 1 or 2, m is selected from 1, 2, 3, 4, 5 and 6, and

wherein when M is zinc, molybdenum, tin or antimony, m is 1, and

wherein when M is manganese or iron, m is 1 or 2,

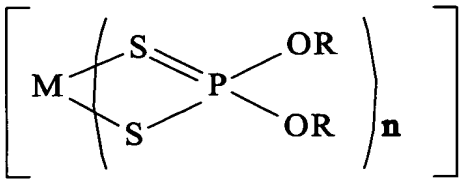
(R)



wherein when M is zinc, molybdenum, tin or antimony, m is 1, and

wherein when M is manganese or iron, m is 1 or 2, and

(S)



wherein R is an alkyl group having one to twelve carbon atoms, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2;

and

at least one condensed phosphate and/or polyoxycarboxylic acid coordinated to the remaining coordination sites.

Claim 10 (Currently Amended): An aqueous lubricant ~~comprising~~ as in claim 9, wherein the multi-ligand metal chelate compound is ~~according to claim 9,~~ suspended or dispersed in an aqueous liquid.

Claim 11 (Previously Presented): An aqueous lubricant as in claim 10, further comprising a soluble condensed phosphate salt, a fatty acid sodium salt, a fatty acid potassium salt and/or a soluble polycarboxylic acid salt.

Claim 12 (Previously Presented): A method of forming a lubricating film on a metal material comprising:

forming a phosphate film on the metal material, the phosphate film comprising zinc and/or iron ions; and

immersing the metal material in the aqueous lubricant of claim 10, whereby a ligand not having sulfur as a coordinating atom reacts with the zinc and/or iron ions in said phosphate film.

Claim 13 (Previously Presented): A method as in claim 12, wherein a crystalline polynuclear metal chelate compound is formed on the phosphate film.

Claim 14 (Previously Presented): A method of forming a lubricating film on a metal material comprising:

forming a phosphate film on the metal material, the phosphate film comprising zinc and/or iron ions; and

immersing the metal material in the aqueous lubricant of claim 11, whereby a ligand not having sulfur as a coordinating atom reacts with the zinc and/or iron ions in said phosphate film.

Claim 15 (Previously Presented): A method as in claim 14, wherein a crystalline polynuclear metal chelate compound is formed on the phosphate film.

Claim 16 (Previously Presented): A method of forming a lubricating film on at least one surface selected from a metal material surface and a metal mold surface, comprising applying the aqueous lubricant of claim 10 to the at least one surface.

Claim 17 (Previously Presented): A method as in claim 16, further comprising drying the at least one surface after application of the aqueous lubricant.

Claim 18 (Previously Presented): A method as in claim 17, further comprising plastically working the metal material.

Claim 19 (Previously Presented): A method as in claim 18, further comprising contacting the dried aqueous lubricant with a soluble condensed phosphate salt and/or a soluble polyoxycarboxylic acid salt before plastically working the metal material.

Claim 20 (Previously Presented): A method of forming a lubricating film on at least one surface selected from a metal material surface and a metal mold surface, comprising applying the aqueous lubricant of claim 11 to the at least one surface.

Claim 21 (Previously Presented): A method as in claim 20, further comprising drying the at least one surface after application of the aqueous lubricant.

Claim 22 (Previously Presented): A method as in claim 21, further comprising plastically working the metal material.

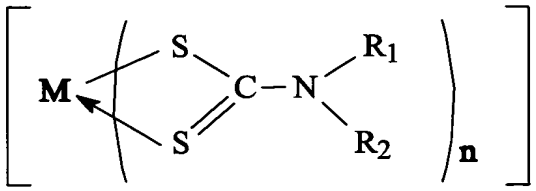
Claim 23 (Previously Presented): A method as in claim 22, further comprising contacting the dried aqueous lubricant with a soluble condensed phosphate salt and/or a soluble polyoxycarboxylic acid salt before plastically working the metal material.

Claim 24 (Currently Amended): ~~A~~ An aqueous lubricant comprising an aqueous liquid and at least one compound ~~comprising~~, said compound having the following structure:

at least one multi-valent metal ion selected from the group consisting of zinc, manganese, iron, molybdenum, tin and antimony,

at least one polydentate chelate ligand having at least two sulfur atoms as coordinating atoms, the at least two sulfur coordinating atoms being bound to the at least one metal ion, the at least one ligand having a formula selected from the group consisting of the following formulas (A) to (L), (O), (P) and (S):

(A)



wherein R_1 is the same as or different from R_2,

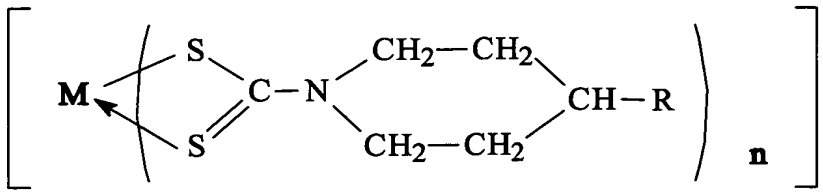
wherein when R_1 and R_2 are the same, each of R_1 and R_2 is H, $-CH_3$, $-C_2H_5$, $-C_3H_7$ (straight chain), iso-C_3H_7, $-C_4H_9$ (straight chain), iso-C_4H_9, tert-C_4H_9 or $-C_6H_5$, and

wherein when R_1 and R_2 are different, R_1 is H and R_2 is $-CH_3$, $-C_2H_5$, $-C_3H_7$ (straight chain), iso-C_3H_7, iso-C_4H_9, tert-C_4H_9 or $-C_4H_9$ (straight chain); or R_1 is $-CH_3$ or $-C_2H_5$ and R_2 is $-C_6H_5$,

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(B)

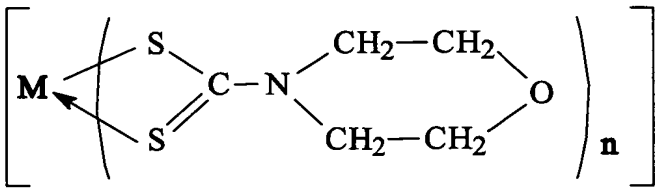


wherein R is H, $-CH_3$ or $-C_2H_5$, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

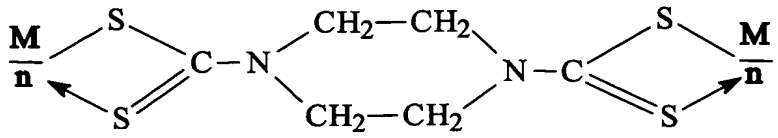
(C)



wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

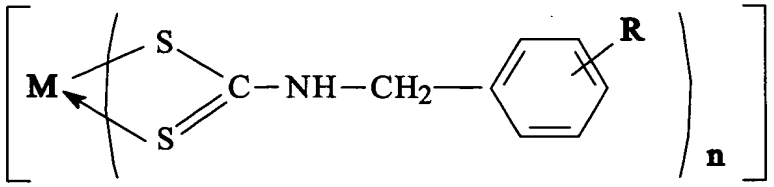
(D)



wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(E)

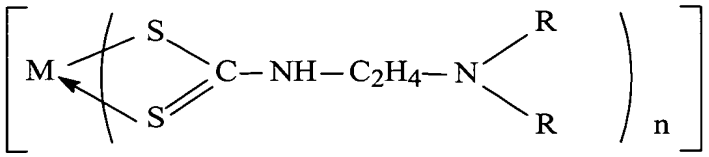


wherein R is ortho-NO_2, para-NO_2, meta-OCH_3, meta-CH_3 or meta-C_2H_5, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(F)

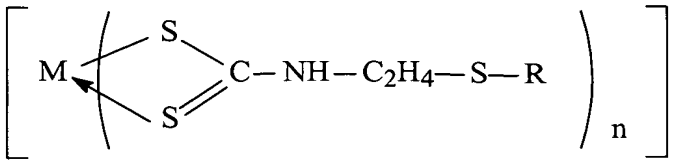


wherein R is -CH_3, -C_2H_5, -C_3H_7 (straight chain) or iso-C_3H_7, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(G)

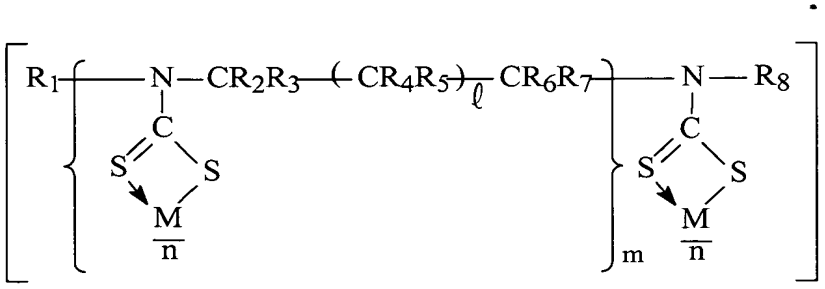


wherein R is H or an alkyl group of 1-12 carbon atoms, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(H)



wherein when m is 1 and ℓ is 0, R_1-R_3 and R_6-R_8 are H; or R_1 is -CH_3 and R_2-R_3, R_6-R_8 are H; or R_1 is -C_2H_5 and R_2-R_3, R_6-R_8 are H; or R_1 is -C_3H_5 (straight chain) or iso-C_3H_5 and R_2-R_3, R_6-R_8 are H; or R_1 is -C_4H_9 (straight chain), iso-C_4H_9 or tert-C_4H_9, and R_2-R_3, R_6-R_8 are H; or R_2 and R_3 are -CH_3 and R_1, R_6-R_8 are H; or R_2 and R_6 are -CH_3 and R_1, R_3, R_7-R_8 are H; or R_2, R_3, R_6 and R_7 are -CH_3 and R_1 and R_8 are H; or R_1 and R_8 are -CH_3 and R_2-R_3, R_6-R_7 are H; or R_1 and R_8 are -C_2H_5 and R_2-R_3, R_6-R_7 are H; or R_1 and R_8 are -C_3H_5 (straight chain) or iso-C_3H_5 and R_2-R_3, R_6, R_7 are H; or R_1 and R_8 are -C_4H_9 (straight chain), iso-C_4H_9 or tert-C_4H_9 and R_2-R_3, R_6-R_7 are H; or R_2 and R_6 are -C_6H_5 and R_1, R_3, R_7-R_8 are H, and

wherein when m is 1 and ℓ is 1, R_1-R_8 are H; or R_4 and R_5 are $-CH_3$ and R_1-R_3, R_6-R_8 are H, and

wherein when m is 1 and ℓ is selected from 2, 3, 4, 5, 6 and 7, R_1-R_8 are H, and

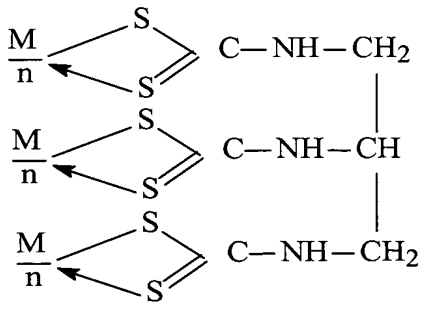
wherein when m is selected from 2, 3, 4, 5, 6, 7, 8 and 9 and ℓ is 0, R_1-R_8 are H; or R_2 is $-CH_3$ and R_1, R_3, R_6-R_8 are H, and

wherein when m is selected from 2, 3, 4, 5, 6, 7, 8 and 9 and ℓ is 1, R_1-R_8 are H, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

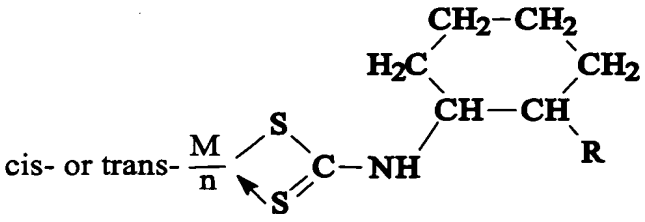
(I)



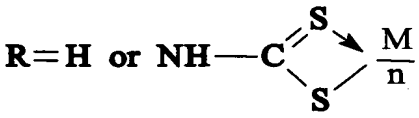
wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(J)



wherein

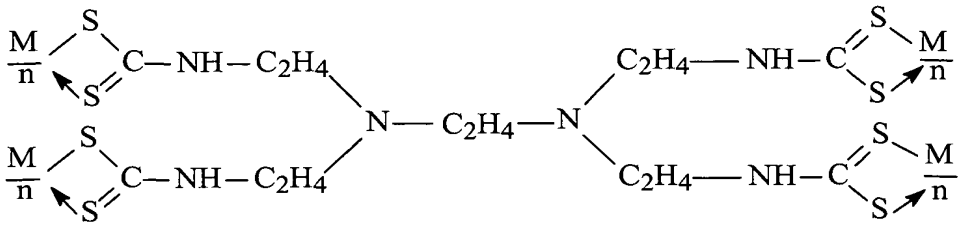


and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

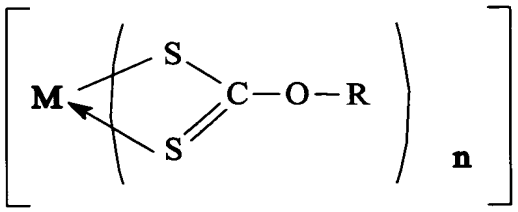
(K)



wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

(L)

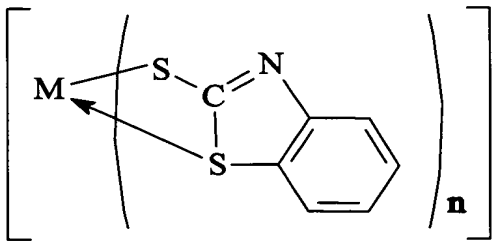


wherein R is a linear or branched alkyl group of 1-12 carbon atoms, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2,

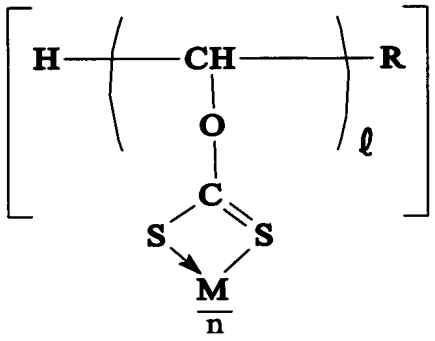
(O)



wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2, and

(P)

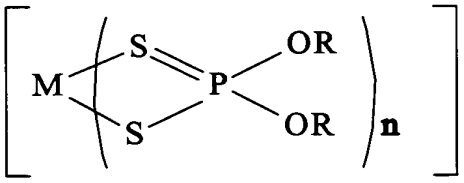


wherein ℓ is selected from 1, 2, 3, 4, 5 and 6, R is H or -COOH, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2, and

(S)



wherein R is an alkyl group having one to twelve carbon atoms, and

wherein when M is zinc, molybdenum, tin or antimony, n is 1, and

wherein when M is manganese or iron, n is 1 or 2;

and

~~at least two other groups bound to the at least one metal ion, the groups selected from condensed phosphate and polyoxycarboxylic acid~~ at least one condensed phosphate and/or polyoxycarboxylic acid coordinated with the metal.

Claim 25 (Currently Amended): An aqueous lubricant ~~comprising~~ as in claim 24, wherein the compound ~~of claim 24~~ is suspended or dispersed in an aqueous liquid.

Claim 26 (Previously Presented): An aqueous lubricant as in claim 25, further comprising a soluble condensed phosphate salt, a fatty acid sodium salt, a fatty acid potassium salt and/or a soluble polyoxycarboxylic acid salt.

Claim 27 (Previously Presented): An aqueous lubricant as in claim 26, further comprising an anionic surfactant or a non-ionic surfactant, wherein the aqueous lubricant has a pH between 8-13.

Claim 28 (Currently Amended): A ~~compound~~ lubricant as in claim 24, wherein the at least one metal ion is a zinc ion and the at least two other groups bound to the zinc ion are selected from condensed phosphate and polyoxycarboxylic acid.

Claim 29 (Currently Amended): A ~~compound~~ lubricant as in claim 28, wherein the condensed phosphate is bound to the zinc ion and the condensed phosphate is tripolyphosphate.

Claim 30 (Currently Amended): A ~~compound~~ lubricant as in claim 29, wherein the polydentate chelate ligand is N,N-diethyldithiocarbamate.

Claim 31 (Currently Amended): A ~~compound~~ lubricant as in claim 24, wherein the polydentate chelate ligand is N,N-diethyldithiocarbamate.

Claim 32 (Currently Amended): A ~~compound~~ lubricant as in claim 31, wherein the condensed phosphate is bound to the at least one metal ion and the condensed phosphate is tripolyphosphate.

Claim 33 (Currently Amended): A ~~compound~~ lubricant as in claim 24, comprising two multi-valent metal ions.

Claim 34 (Currently Amended): A ~~compound~~ lubricant as in claim 33, wherein the condensed phosphate is tripolyphosphate.

Claim 35 (Currently Amended): A ~~compound~~ lubricant as in claim 34, wherein the polydentate chelate ligand is N,N-diethyldithiocarbamate.

Claim 36 (Currently Amended): A method of forming a lubricating film on a metal surface, comprising ~~mixing the compound of claim 24 with an aqueous liquid, thereby forming an aqueous lubricant,~~ applying the aqueous lubricant of claim 24 to the metal surface and drying the metal surface after application of the aqueous lubricant.

Claim 37 (Currently Amended): A method of forming a lubricating film on a metal surface, comprising ~~mixing the compound of claim 29 with an aqueous liquid, thereby forming an aqueous lubricant,~~ applying the aqueous lubricant of claim 29 to the metal surface and drying the metal surface after application of the aqueous lubricant.

Claim 38 (Currently Amended): A method of forming a lubricating film on a metal surface, comprising ~~mixing the compound of claim 35 with an aqueous liquid, thereby forming an aqueous lubricant,~~ applying the aqueous lubricant of claim 35 to the metal surface and drying the metal surface after application of the aqueous lubricant.

Claim 39 (Canceled)

Claim 40 (Currently Amended): A ~~compound~~ lubricant as in claim 9, wherein the at least one metal species is selected from the group consisting of divalent zinc, divalent manganese, trivalent manganese, divalent iron, trivalent iron, tetravalent molybdenum, pentavalent molybdenum, divalent tin, tetravalent tin, trivalent antimony, and pentavalent antimony.

Claim 41 (Previously Presented): A lubricant as in claim 10, further comprising an anionic or non-ionic surfactant, wherein the aqueous lubricant has a pH between 8.0 and 13.0.

Claim 42 (Previously Presented): A lubricant as in claim 41, further comprising a soluble condensed phosphate salt, a fatty acid sodium salt, a fatty acid potassium salt and/or a soluble polyoxycarboxylic acid salt.

Claim 43 (Previously Presented): A lubricant as in claim 42, wherein the lubricant is substantially free of oil and organic solvents.

Claim 44 (Previously Presented): A method for forming a lubricating film on a metal surface, comprising applying the lubricant of claim 43 to the metal surface and drying the metal surface.

Claim 45 (Previously Presented): A method as in claim 44, wherein the metal surface is substantially free of oil.

Claim 46 (Previously Presented): A method as in claim 45, further comprising plastically deforming the metal.

Claim 47 (Currently Amended): A ~~compound~~ lubricant as in claim 9, wherein the at least one metal species is a zinc ion.

Claim 48 (Currently Amended): A ~~compound~~ lubricant as in claim 47, wherein the at least one condensed phosphate is tripolyphosphate and the ~~tripolyphophate~~ tripolyphosphate is bound to the zinc ion.

Claim 49 (Currently Amended): A ~~compound~~ lubricant as in claim 9, wherein the at least one ligand is N,N-diethyldithiocarbamate.

Claims 50-57 (Canceled)